MINE ACCIDENTS IN 1897.

WITH commendable celerity the Home Office has issued, in the form of an advance proof, the tables of accidents and deaths at the Mines and Quarries of the United Kingdom last year. Six foolscap pages closely printed with figures are not likely to attract the ordinary reader; but if they are carefully scanned, several important facts come to light. The Diamond Jubilee year is remarkable for its small death-roll from explosions of fire-damp, as there were but twelve fatal accidents and only nineteen deaths. Probably such a happy result has not been known this century; at all events since 1851, when official statistics first began to be kept, the number of explosions has been gradually diminishing in the most satisfactory manner, and though several great disasters, each involving a loss of more than a hundred lives, have happened of late years, the total number of deaths from explosions has decreased, in spite of the enormous rise in the output of coal. According to the official statistics, the annual number of victims by explosions of fire-damp and coal-dust for the last forty-seven years has only in seven cases been fewer than 100, and in no case less than 49 until last year. Far less satisfactory is the death-roll from falls of ground; this shows no signs of diminution; on the contrary, we find 485 deaths against 439 in the previous year. How long is this state of things to continue? Why do falls happen? The reply is "From want of supports," and the self-evident remedy which suggests itself is "systematic timbering." The German Government has taken the matter in hand by appointing a special Commission to report upon means of preventing accidents from falls of ground. Are we to wait until this Report is issued before grappling with the question? The dangers of fire-damp and coal-dust have now been dealt with by Statutes; and the worst death-trap in the mine should also receive in its turn some special legislative attention?

Shaft accidents are diminishing in number in a way that makes the shaft nowadays almost the safest place in the mine. The miscellaneous accidents, most of which are put down to haulage, are still numerous. It is curious to note, while dealing with fatalities from miscellaneous causes, that the worst mining disaster in the British Isles last year happened at a lead mine and not at a colliery, for an underground fire claimed twenty victims. On the whole, there were 972 persons killed by accidents at mines in this country last year, compared with 1065 in 1896. This is a decrease of ninety-three deaths. How far this is a real improvement cannot be stated until the statistics of persons employed have been collected, so as to enable the death-rate to be calculated.

The final tables tell us that 123 persons were killed at the quarries of the United Kingdom which are included by the Quarries Act, from being more than 20 feet deep. There is a decrease of one death compared with 1896.

The statistical matter has been set up this year in an improved and far more convenient fashion, for the figures can now be read without twisting round the pages sideways.

THE PROPOSED MIDLAND UNIVERSITY.

EDUCATIONAL authorities throughout the country cannot but rejoice in the important speech which Mr. Chamberlain made in Birmingham on Thursday last. A recent Act of Parliament has been passed whereby the Mason College has been made a University College, governed by a representative court of governors, and it was in his new capacity of President of the Mason University College that Mr. Chamberlain took the opportunity of formally launching the scheme for the creation of a great University of the Midlands. The idea of a Midland University has been under consideration for several years past, and with the strong support now promised by Mr. Chamberlain, Birmingham may confidently look forward to shortly becoming the proud possessor of what London has been struggling in vain so many years to obtain—a great teaching University depending for its position and authority not on traditions, but founded in harmony with modern requirements, in sympathy with the scientific and educational needs and aspirations of the day.

Prof. Mahaffy, a few weeks ago, humorously represented some of the objections which have been raised to the establishment of a new University in Birmingham by remarking, "Oxford I know, Cambridge I know; but who are ye?" Mr. Chamberlain, however, has met and anticipated such and similar flimsy protests by at once, in his characteristic manner, going to the root of the matter. "The new University cannot in any sense be a competitor with the old Universities of Oxford and Cambridge . . . they offered associations, traditions, and conditions which it could not, under any circumstances, attempt or hope to emulate. Therefore, whilst they could not imitate Oxford and Cambridge if they would, he would say also that they *would not if they could* . . . because when they came to create new Universities in this modern time, and under modern conditions, it was something rather different they had in view." It cannot be sufficiently recognised that whilst traditions may be, and often are, a power for good, a slavish and blind adherence to them may also work incalculable mischief in society. It is not too much to say that the great University Colleges which have grown up in all parts of the country during the latter half of the present century, have been not a little hampered in their work, not a little shorn of the recognition due to them by being, in some respects, overshadowed by the older Universities. The splendid scientific work, however, which has emanated from these too frequently derided and belittled Provincial Colleges is gradually bringing about a change in public opinion. The munificent support which has recently been accorded to the Owens College, Manchester, and the attitude which so distinguished a statesman as Mr. Chamberlain has taken up with regard to the proposed Midland University, are auguries that a new era is commencing, when the public are beginning to realise what has been and still remains to be done by modern Universities unhampered by local traditions, in touch with the time, and animated with enthusiasm not only for the communication of knowledge, but for the advancement of learning by the prosecution of original researches. There is one point to which we venture to hope those entrusted with the great task of building up this new University will give due weight, and that is the study of modern languages. We as a nation are far behind Germany, for example, in the importance which we attach to the acquirement of foreign tongues, and our trade, we have often been told, suffers in consequence. Let Birmingham set the example, and in addition to thoroughly equipping its faculties of science, art and medicine, let it have the honour of establishing a great school of modern languages. Educationists in this country, who for years have been vainly endeavouring to obtain an effectual hearing for the need of harmonising modern scientific education not only with the requirements of the time, but with the advance in science, owe Mr. Chamberlain a debt of gratitude for his address, of which we give the following abstract from the *Times* report:—

> The new governing body of the College were entertained at luncheon in the Council-house by the Lord Mayor (Mr. C. G. Beale), who proposed the toast of "Mason University College," which was coupled with the name of the president, Mr. Chamberlain.
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> Mr. Chamberlain, in reply, said that day's proceedings marked a stage in the history of the College. He did not dwell upon the service rendered by the College to the city and

district, its rapid growth, and the reputation it had acquired, which was due in large part to the capacity and the character of the teachers it had been able to attract. The Mason College at the present time was hampered by a lack of resources. They had not the funds to deal with the growing requirements of the time and of the district, to provide proper appliances, proper buildings, and proper remuneration for those who acted as professors and demonstrators in the institution. The Lord Mayor had been good enough to say that the deficit was a moderate one, but deficits had a most uncomfortable habit of increasing, and, although the endowment which was provided for the College by the munificence of Sir Josiah Mason was sufficient for it in its infancy, it was inadequate for present requirements. The trustees had always contemplated the possibility that they would be able to crown the edifice of their educational institution by the establishment of a local University to meet the requirements of the district, and he need hardly point out that if that object found favour in their eyes, as the greater included the less, so the relief desired would come in the creation of a properly-endowed University into which the Mason College would be practically absorbed. He hoped the ambition to which he had referred would not in the present day be considered unreasonable.

THE MULTIPLICATION OF UNIVERSITIES.

There was a time, no doubt, when members of the older Universities, and men who were altogether independent of them, believed that the multiplication of Universities would injure education ; that it would lead, in a certain sense, to the degradation and the lowering of the value of the degrees which Universities conferred ; but very much had happened in the last twenty years, and he could hardly imagine any reasonable man arguing in that strain at the present moment. The fact was the need of the local University had been recognised, and at the present time Birmingham, and the surrounding district, was the only great centre in England which was not already provided with such an educational institution. Liverpool, Manchester, and Leeds had their Victoria University ; Newcastle was closely connected with Durham ; Wales had its own University ; London had a University of a kind, which, when Londoners were able to make up their minds, would no doubt develop into something much better. He could not conceive of any district at the present time which more needed or more deserved the establishment of such an institution than the district in which he was speaking. But if they went outside England the argument was greatly strengthened. They looked to Germany for an example and a model of everything in the way of educational organisation and progress. Education was made in Germany, and they were not ashamed to take the lesson to heart. Germany, with forty-six millions of people, had twenty-one Universities. Their own sister kingdom, Scotland, with four million people, had four Universities ; in England and Wales, with nearly thirty millions of people, they had six Universities. *A priori*, at any rate, he thought they had made out a case for a University.

EDUCATION IN THE MIDLANDS.

But there were other reasons he drew from the educational history of the district. The right hon. gentleman then proceeded to sketch the rapid and remarkable development of education in the district, speaking in high terms of the educational institutions. They had Mason College, which at last had been incorporated as a full University college. Was it not clear that after that which had been accomplished so rapidly they might ask without presumption for an institution which should crown that circle of their educational opportunities, and which should direct and control and guide and coordinate these local educational works, and so put themselves in a position to equal and rival every other part of the kingdom ? He would like to strengthen his argument by a quotation from a man who, perhaps more than any other, was qualified to speak upon that subject—he meant the late Prof. Huxley, who said : "But a city University is, in my judgment, a corporation which has charge of the interests of knowledge as such, and the business of which is to represent knowledge by the acquirement by its members of increased knowledge, by their investigations to diffuse knowledge, by their teaching, and last, but not least, to create a respect for knowledge among their fellow men by their personal example and influence." Prof. Huxley was writing then in reference to the proposed creation of a University for Manchester. Whatever argument was then applicable to Manchester was applicable in no less a degree to Birmingham and the district, because he believed that there was no district in the kingdom that was so distinct in what he might call the peculiar genus, knowledge, and character of its people, and in the nature of its occupations as that great manufacturing district which had the vast population of more than 2,000,000 or so in and around Birmingham within a radius of twenty or thirty miles.

THE OBJECTS OF THE UNIVERSITY.

What did they mean by a University ? What new institution was it they desired to place in Birmingham ? They meant, he took it, a great school of universal instruction not confined to any particular branch of knowledge, but taking all knowledge as its province, and arranging regular courses of complete instruction in all the great branches of information. They must, in the second place, use that knowledge so that the professors and teachers should be associated with the students, and all should be students together, and so that those who came to teach should continue to learn, and so that the most important work of original research should be continuously carried on under the most favourable circumstances ; and, lastly, they meant by a University a body which should have power to control the courses of education and to confer degrees which should test the value of its instruction. He put that last because he believed that of the three objects of the University it was the least important, although it was necessary to a University, and without it Mason College had lost a number of students. One thing he might at once admit. Any new University which they might succeed in establishing would not be in any sense a competitor with the old Universities of Oxford and Cambridge. Those Universities appealed necessarily to classes many of whom they could not expect to touch, and they offered associations, traditions, and conditions which they could not under any circumstances attempt or hope to emulate. Therefore, while they could not imitate Oxford and Cambridge if they would, he would say also that they would not if they could, because, while the older Universities supplied a want of their own, and if anything were to happen to them they would leave an incalculable gap in all that was interesting and picturesque in English life and English history, yet when they came to create new Universities in this modern time and under modern conditions it was something rather different that they had in view. He would say, rather, that they should take as their model, not indeed absolutely, the great Universities of Scotland—of Edinburgh or of Glasgow. He thought the University of Glasgow was built, much as they hoped theirs would be, upon a pre-existent college which had subsequently been absorbed or developed into a University. But there was no doubt whatever, from the experience of such Universities as those he had referred to, that to place them in the middle of a great industrial and manufacturing population was to do something to elevate the whole mass to higher aims and higher intellectual ambitions than would otherwise be possible to people engaged entirely in trading and commercial pursuits.

THE NEED OF MONEY.

Rome was not built in a day, and their University would, he dare say, for generations yet to come give opportunities to liberal benefactors to improve and extend it. But one thing was essential, one thing they must do—put the University in a position to attract the best teachers, to attract men of the highest reputation, and to keep them there when they had induced them to come. Pointing out how this ideal could be attained, Mr. Chamberlain remarked that all they wanted was very little—only money ; and that, he hoped, would be forthcoming. The sacrifice must be proportioned to the importance of the object they had in view. He had no idea that Birmingham or the district would be satisfied with a starved University. He would rather wait another fifty years if necessary than start with everything pinched and mean about them, with insufficient buildings, with inadequate appliances, and, above all, with insufficient remuneration for those whom they employed. Therefore, he urged that they should start the scheme with a determination to make it a great success. Let them start it with an endowment which, at all events, would secure the main objects which they had in view. It was calculated that what would be required would be 250,000*l*. He was not at all inclined to minimise a demand of that sort made under the circumstances. Money would not be spent in colossal buildings. They must come later on. It was chiefly to secure a satisfactory endowment for a complete professorial body in connection with the University. In addition to the chairs which were already endowed they wanted endowments varying from 400*l.* to 600*l.* a year, which he did not think would be considered by any one as excessive, for fifteen chairs. The cost of such an endowment was, therefore, from 12,000*l.* to 20,000*l.* If this work was to be carried on they must not expect too much from individuals. They might expect something from the great trade of Birmingham, a little from each member of the trade, if they would organise themselves for the purpose. The great industries when appealed to would see that they had a great duty in that matter, and would be glad to be represented in the work. They had already made some progress, and from two or three whom they had approached they might certainly expect the endowment of such a professorship. His duty that day was to put the question before them and ask them to accept the principle and give their good will and assistance in carrying it out.

FRANCESCO BRIOSCHI

BIOGRAPHICAL notices of this veteran Italian mathematician, who died on December 13 last, have been given in the *Comptes rendus* by M. Hermite, and by Cremona and Beltrami in the *Annali di Matematica*, the journal of which Brioschi was chief editor, and one of the founders in 1858; from these notices many of the following details of Brioschi's scientific work have been extracted.

This work covers about half a century in time of production, and ranges over the subjects of Analysis, Geometry, Higher Algebra, Differential Equations, Elliptic and Abelian Functions, Mechanics and Mathematical Physics.

Brioschi occupied himself at first with various dynamical questions, in continuation of the researches of Lagrange and Dirichlet. He next turned to the development of Gauss's analytic theory of surfaces, which had hitherto not attracted the attention it deserved. He also discussed the theory of the Correspondence of Poncelet's Polygons; as subsequently developed by Moutard and Halphen, this theory appears likely to provide the simplest analytical view of the Multiplication and Division of Elliptic Functions, at present engaging the attention of Prof. H. Weber.

But the true bent of Brioschi's genius was found when he attacked the general theory of algebraical equations, being inspired by Hermite's discovery of the transcendental solution of the quintic equation, which has recently been summarised with developments in Klein's Lectures on the "Ikosahedron."

The history of the quintic equation throws a curious light upon the ways of a certain typical British school of mathematicians, who are accustomed to jog along in intellectual isolation, knowing and caring nothing for the advances made by others; like "Rip van Winkles," as Clifford called them.

Working in this hermit-like way, Mr. Jerrard made the important discovery that it was possible by the solution of algebraical equations of an order not higher than the third, to reduce the general quintic equation to the trinomial form; but Klein has pointed out, in the "Ikosahedron," that all this had been done a hundred years ago, by the Swedish mathematician Bring, in 1786.

Arguing by analogy, Mr. Jerrard, it is related, was firmly convinced that by the solution of a quartic, it would be possible to reduce the quintic to the binomial form, when the algebraical solution would be complete; and he died in happiness before having discovered his error, which a slight acquaintance with the work of Abel and Galois would have revealed.

The reduction by Hermite of the general quintic equation to the form of the Modular Equation of the Transformation of the Fifth Order of Elliptic Functions suggested to Brioschi the examination of the corresponding equations of higher order; and Brioschi's last communication was one to the Mathematical Congress at Zürich, 1897, on the particular case of the Transformation of the Eleventh Order.

Galois's statements ("Les idées précipitamment émises," Halphen, "Fonctions elliptiques," iii. p. 124), which he did not live to demonstrate, that the Modular Equations of the Fifth, Seventh, and Eleventh Order have Resolvents of the same order, had long baffled analysts, and they did not receive universal acceptance till the appearance of the article in "Tortolini," 1853, by Betti, Brioschi's co-editor, who succeeded in retracing Galois's line of argument; Betti's article being followed up by Hermite, in the *Comptes rendus*, 1859.

In his biographical memoir M. Hermite points out that Brioschi was the pioneer in another line of generalisation in the theory of algebraical equations, in his discovery of the solution of the general sextic equation, employing for that purpose the six even Θ functions, of two variables. The details of the development of this theory will afford plenty of employment to young mathematicians for some time to come.

In addition to his scientific labours, Brioschi found time to devote to public duties; he acted as an Under-Secretary of State, and was a Senator of the Upper House of the Italian Parliament; he was an organiser of the railway system of Italy, and he served on the International Committee of the Metric System.

He was a member of most of the Academies and Scientific Societies of Europe and America, and President of the Royal Academy of Lincei. The biographical notices by those who were personally acquainted with him speak highly of the respect and esteem which he inspired. G.

REV. C. L. DODGSON.

A FORMIDABLE champion of Euclidean methods in the elementary teaching of geometry has just passed away after a short illness. The Rev. Charles Lutwidge Dodgson was born in 1832 at Daresbury in Cheshire; and, after passing five years at Rugby School, matriculated in 1850 at Christ Church, Oxford, where he was appointed a student in 1852, and graduated in 1854 with honours in both classics and mathematics. He was appointed Mathematical Lecturer in the College in 1855, and retained that office till 1881; he further served the University as Mathematical Examiner in 1863, and Moderator in 1868.

The mathematical subject in which he was most interested was the elementary teaching of geometry; of this he had a personal experience of twenty-six years. Without stint of labour he submitted to rigid logical analysis every text-book on the subject that came to his notice, undismayed by their surprising number, the result being the amusing and, at the same time, deep "Euclid and his Modern Rivals," published in 1879, in which he demonstrated the logical superiority of Euclid's method over all the others examined. The Appendices of this book are very valuable. A "Supplement" to it appeared in 1885. In 1882 he edited Euclid, Books I. and II., with an introduction; and in 1888 he published "A New Theory of Parallels," in the third edition of which (1890) he simplified his fundamental axiom.

His other mathematical work comprises "A Syllabus of Plane Analytical Geometry" (1860), "Formulæ of Plain Trigonometry" (1861), "An Elementary Treatise on Determinants" (1867), "Euclid, Book V., proved Algebraically" (1874), and "Pillow Problems" (1893). He invented a new method of evaluating determinants, which is published in the *Proceedings* of the Royal Society for 1866, and also a method (which was published in NATURE) of easily determining the day of the